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FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF THE SECRETARY

November 21, 2003

Ms. Marlene H. Dortch
Secretary
Federal Communications Commission
445 12th Street, S.W.
Washington, DC 20554

In the Matter of Amendment of Parts 1, 21, 73, 74 and 101 of the Commission's Rules to Facilitate the Provision Fixed and Mobile Broadband Access, Educational and Other Advanced Services in the 2150-2162 and 2500-2690 MHz Bands, WT Docket No. 03-66 and RM-10586

Part 1 of the Commission's Rules – Further Competitive Bidding Procedures , WT Docket No. 03-67

Amendment of Parts 21 and 74 to Enable Multipoint Distribution Service and the Instructional Television Fixed Service Amendment of Parts 21 and 74 to Engage in Fixed Two-way Transmissions, MM Docket No. 97-217

Amendment of Parts 21 and 74 of the Commission's Rules with Regard to Licensing in the Multipoint Distribution Service and in the Instructional Television Fixed Service for the Gulf of Mexico, WT Docket No. 02-68 and RM-9718

Dear Ms. Dortch:

On Thursday, November 20, 2003, Patrick Gelsinger, Chief Technical Officer, Mike Chartier and Peter Pitsch of Intel met with FCC Commissioner Kathleen Q. Abernathy and her senior legal assistant, Jennifer Manner. Mr. Gelsinger presented the attached presentation which lays out how digitization could revolutionize radio technology and how Intel supports new spectrum management policies that could foster this innovation.

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Although the above discussion did not address specific rulemakings, the background slides in this presentation summarize Intel's positions regarding the above rulemakings. In the last slide Intel expresses its support for the WCA/NIA/CTN coalition proposal but with open eligibility on the entire MMDS and ITFS spectrum. These views are set out in more detail in its comment filed in those proceedings.

Pursuant to Section 1.1206 of the Commission's Rules, 47 C.F.R. § 1.1206, a copy of this submission is being provided to Commissioner Abernathy and Ms. Manner. Please contact the undersigned with any questions in connection with this filing.

Respectfully submitted,

Peter K. Pitsch

Peter K. Pitsch
Intel Corporation
Director, Communications Policy

cc:
Commissioner Kathleen Q. Abernathy
Jennifer Manner


The Radio Revolution
Technology & Policy Issues
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AGENDA

Radio Free Intel-

How "Moore's law meeting Marconi" will unleash innovation in radio.

Technology and Policy-

Intel's support of new spectrum management policies to enable & exploit this innovation.

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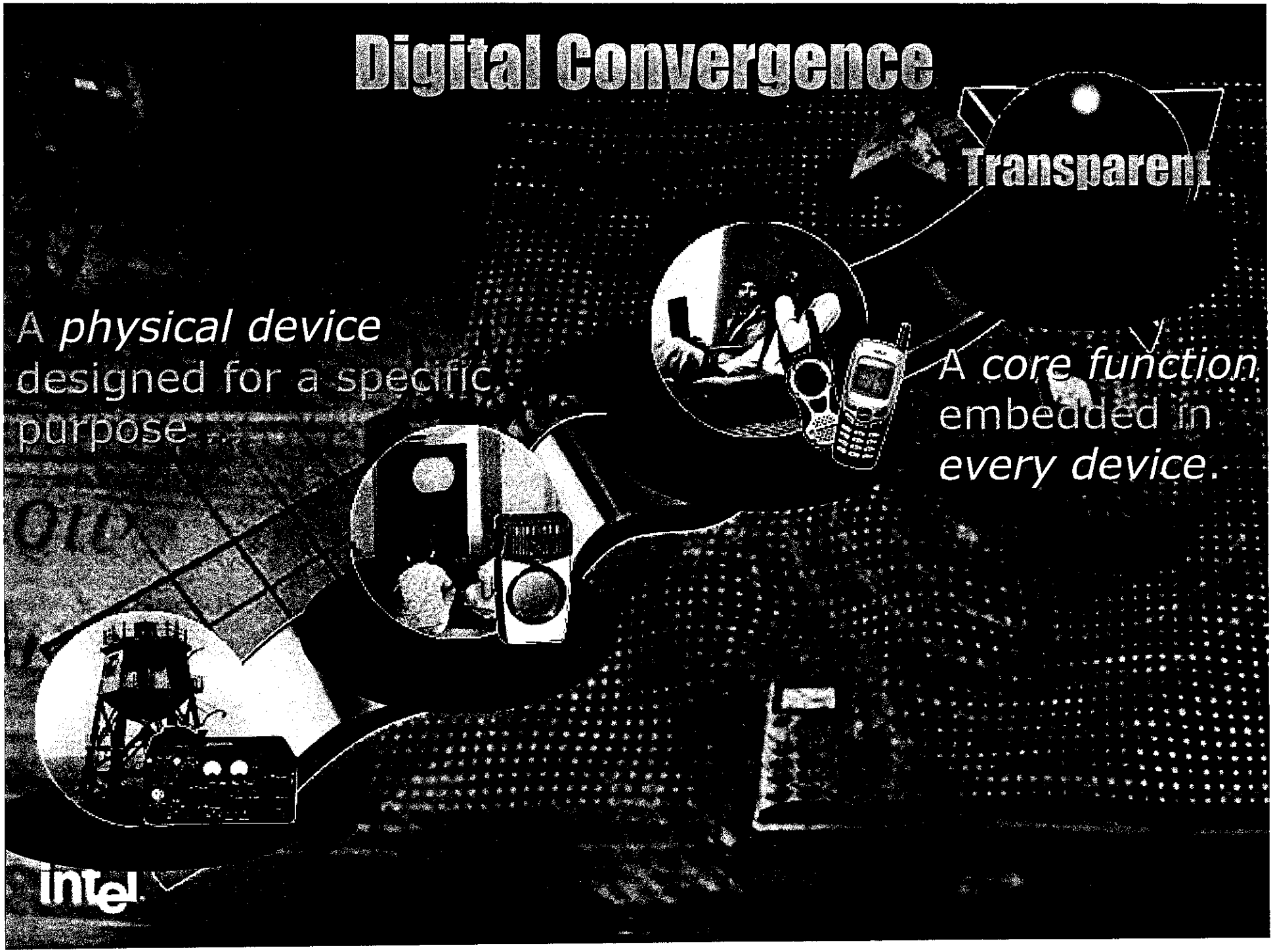
Digital Convergence
Transparent
A physical device designed for a specific purpose...
A core function embedded in every device.
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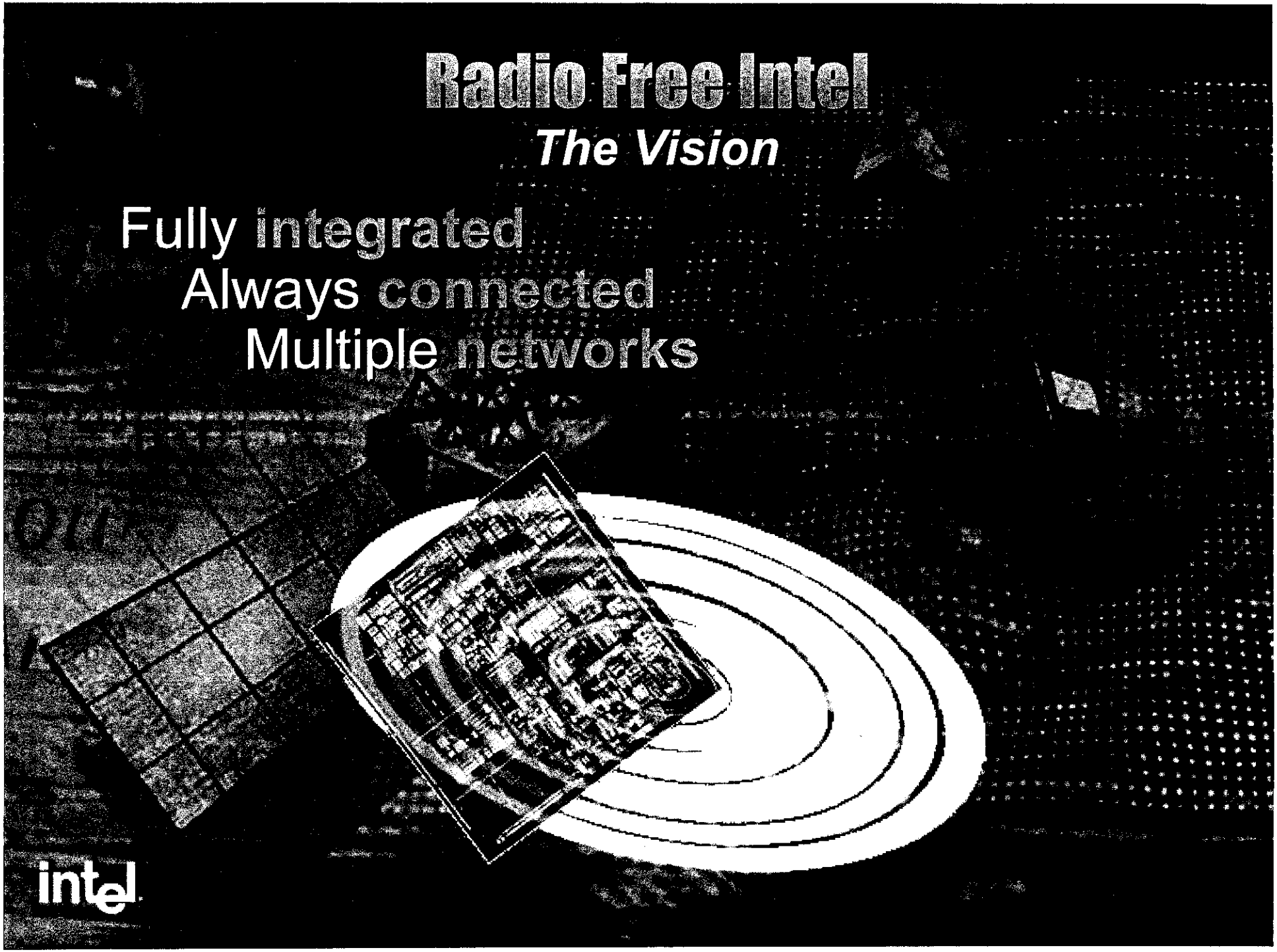
Radio Free Intel

The Vision

Fully integrated
Always connected
Multiple networks



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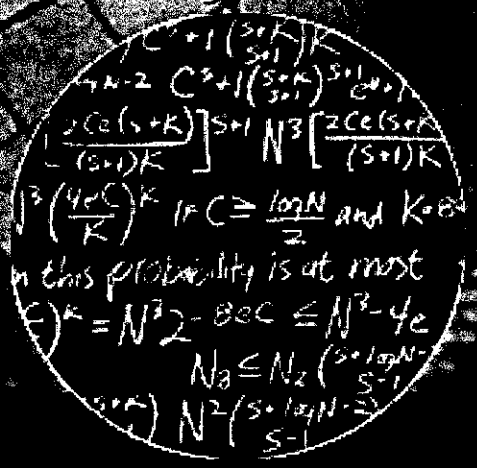
Radio Free Intel

System-level Innovation

Adapting to the User

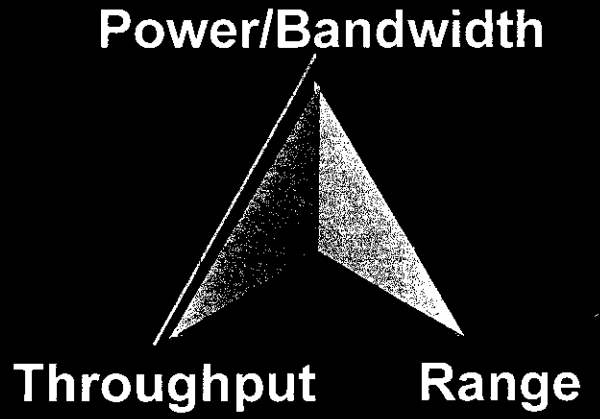
Adapting to the Network

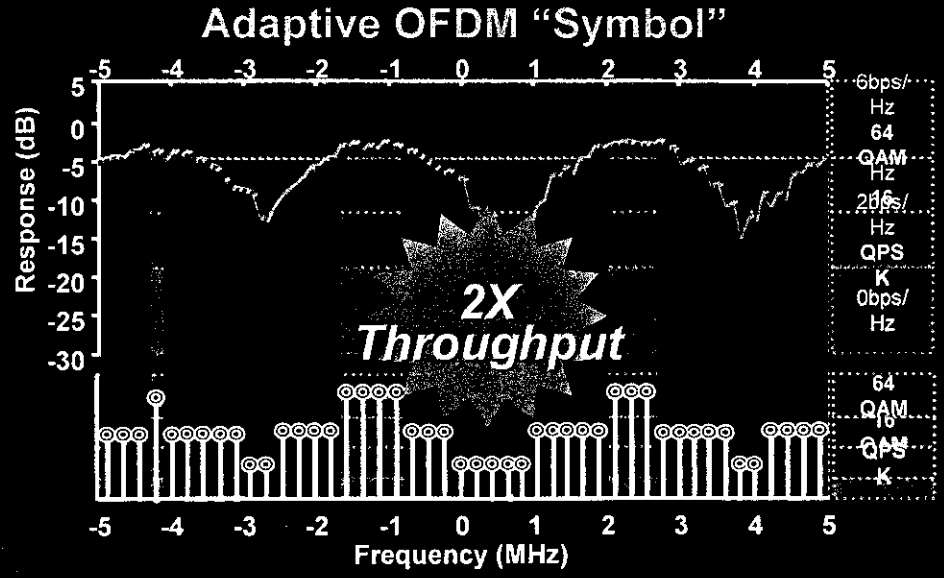
Adapting to Physics

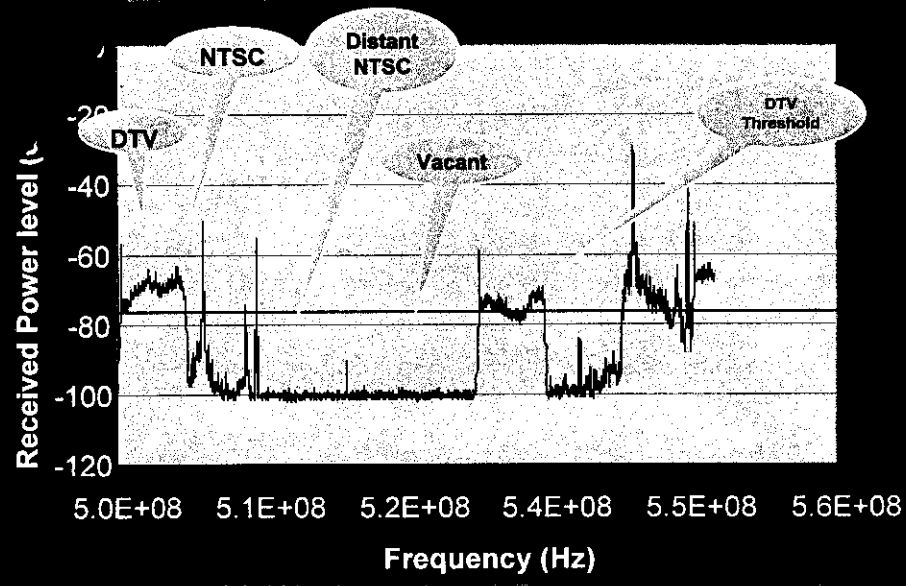


Adapting to Physics

Wireless Performance







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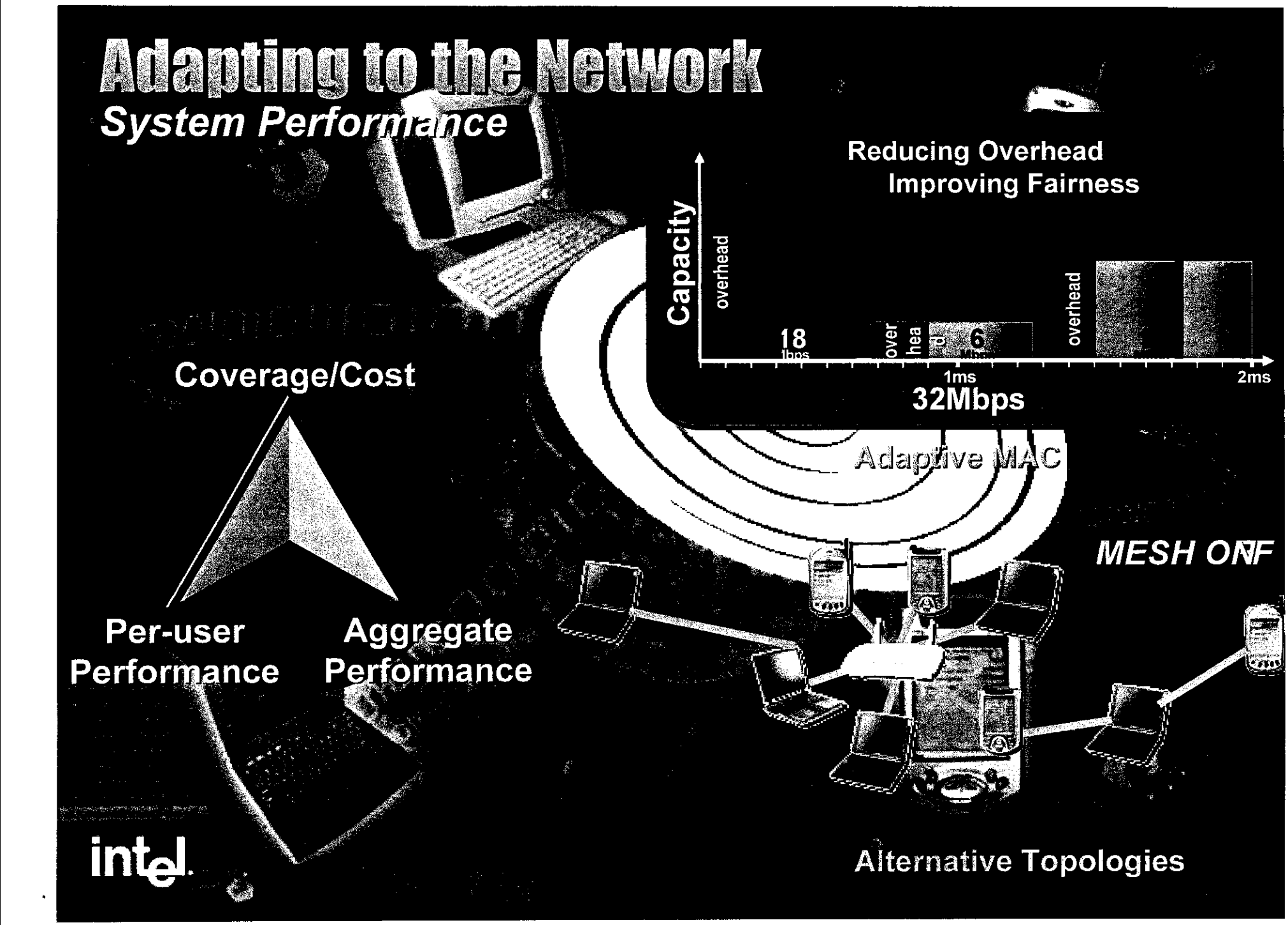
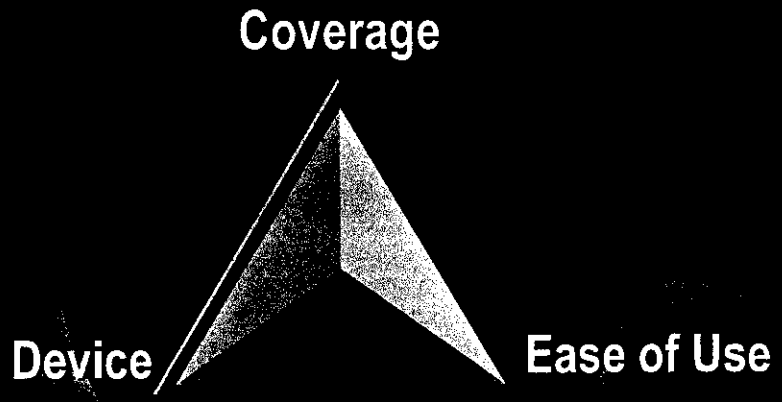
Adapting to the Network

System Performance



Adapting to the User

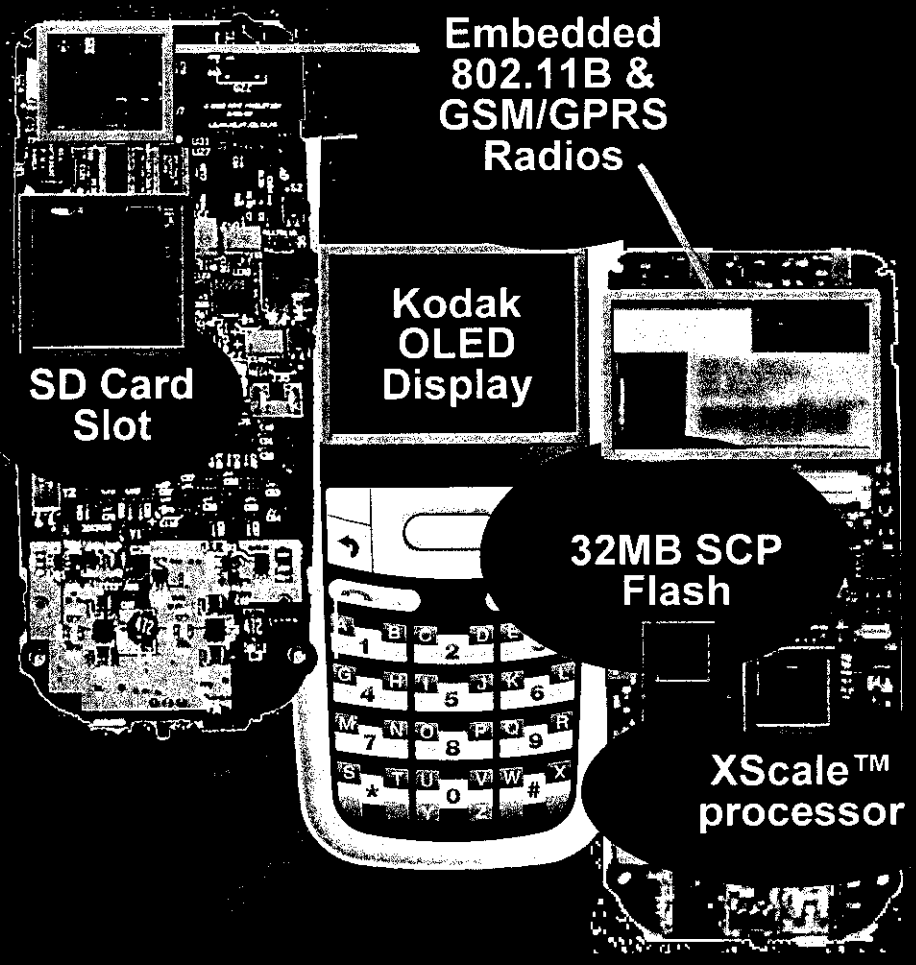
Adaptive Communication Technology



Research

powerful, flexible platforms
trust identity, authentication
cross device collaboration
efficient power management
intelligent network

Universal Communicator



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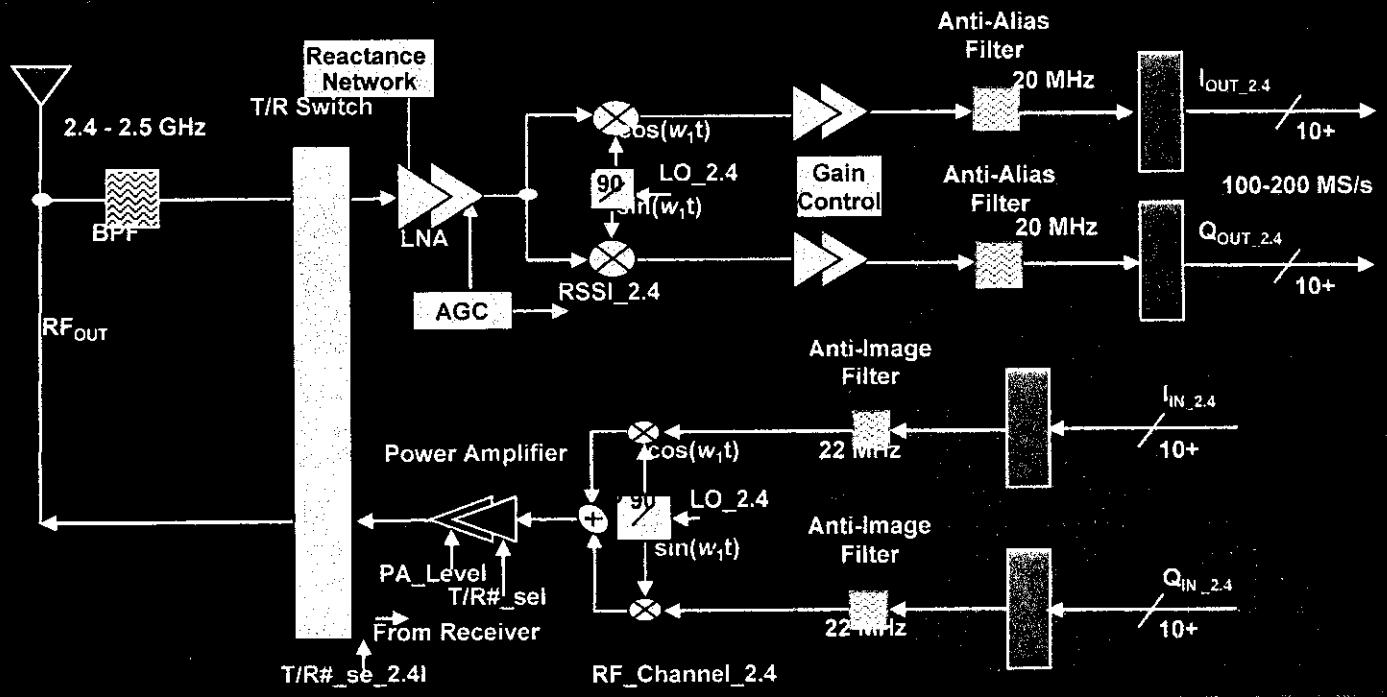
The Fundamental Technology Shift: The Radio Renaissance

Today's Radio

Analog Direct Conversion



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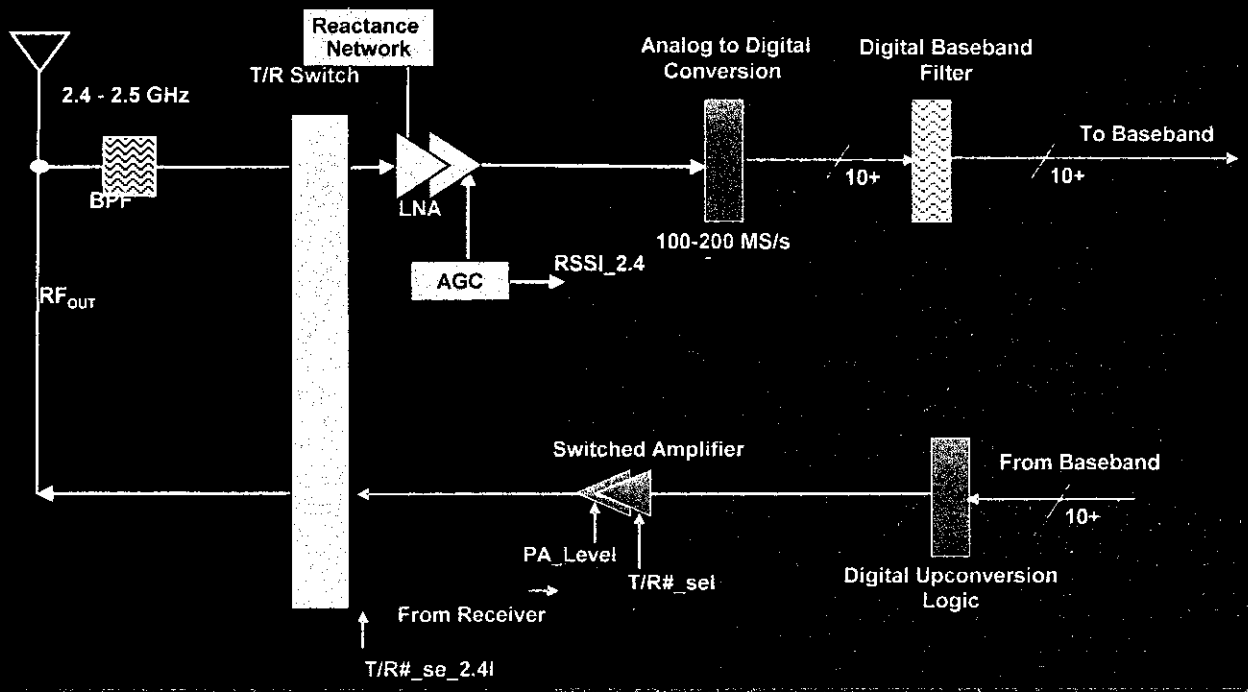
The Radio Renaissance

Tomorrow's Radio
Digital Direct Conversion



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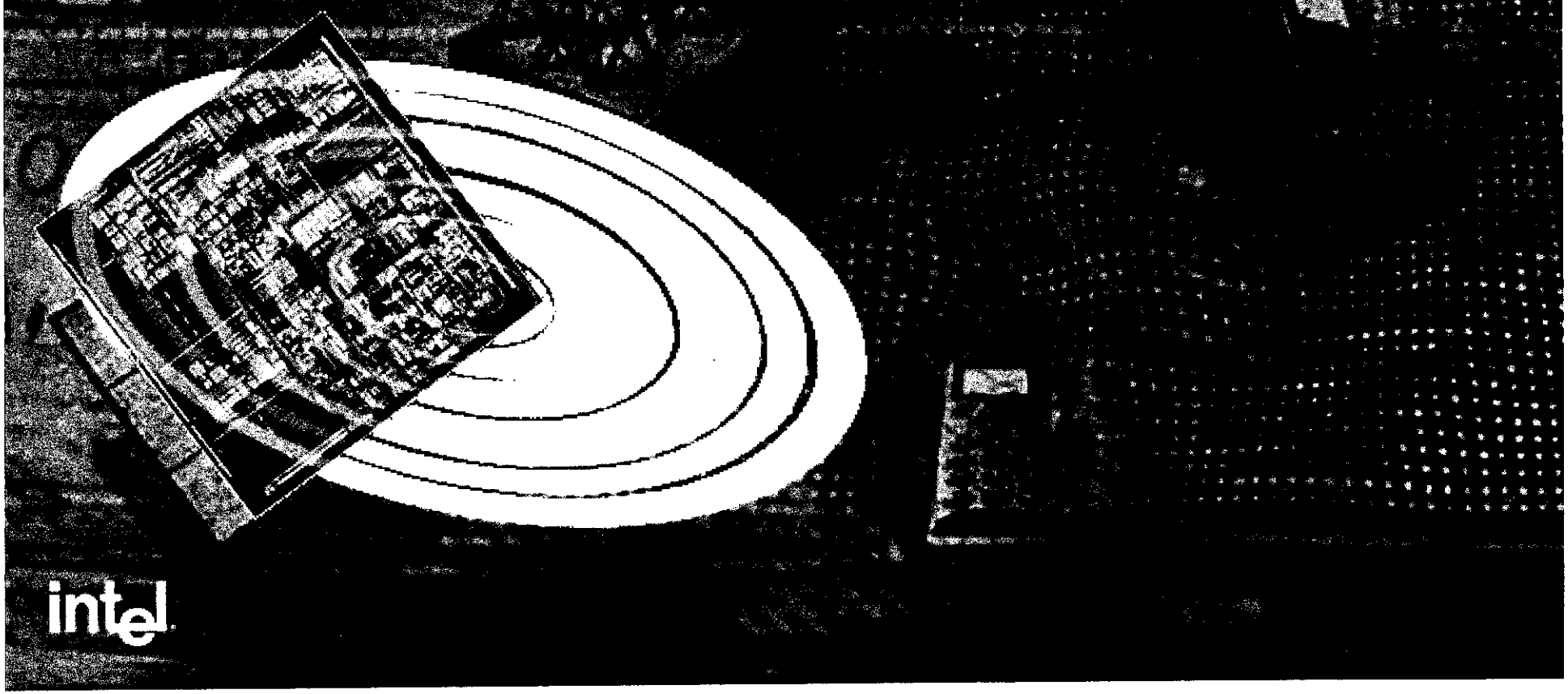
Moore's law impact #1- More MIPS

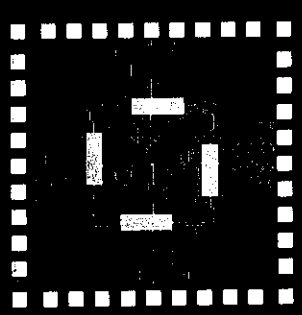
By 2010 based on Moore's Law, a single microprocessor will contain several billion transistors and process more than a trillion instructions per second.

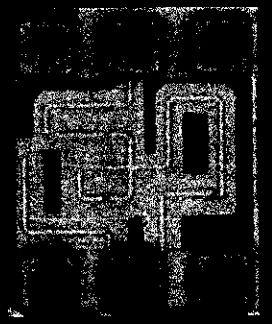


Moore's law influence #2- CMOS RF

Siliconizing
Radios

CMOS Oscillators at >75GHz


4 transistor design


1 transistor design

- VCO
  - power amplifier
    - low noise amplifier
      - synthesizer
        - high quality passives

- **90 nm digital CMOS process: Low V device used**
- **Low V digital device speed can be used effectively**
- **Highest speed oscillator achieved in CMOS**
- **Scaling CMOS benefits microwave circuits**

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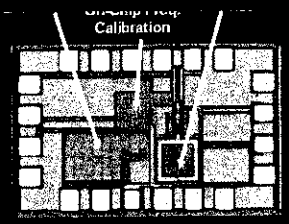
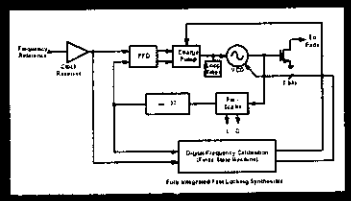
Intel Labs





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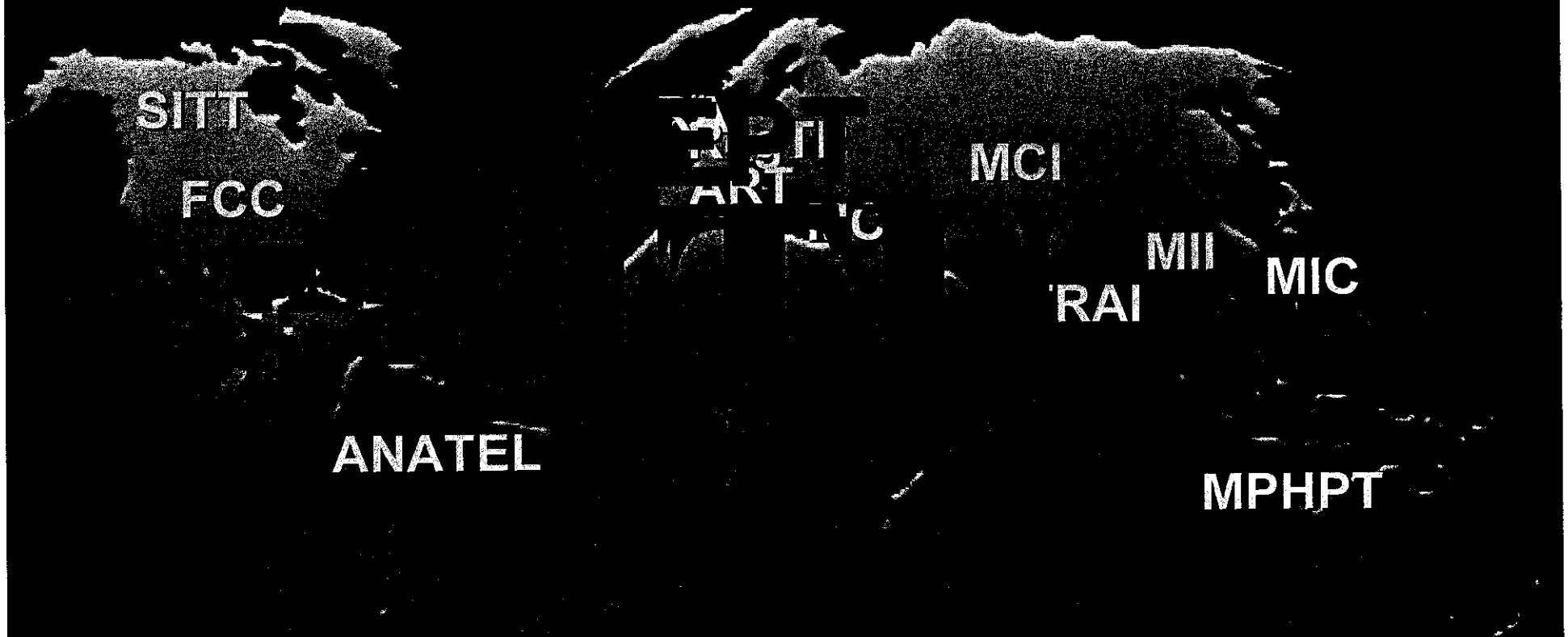
Our Regulatory Responsibility



Regulatory *Enablers*, Not *Barriers*

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Intel's Spectrum & Broadband Principles

Spectrum: Encourage Viral Innovation

Innovative spectrum management for innovative technology:

- ***Overlays for Agile Radios, Underlays for UWB.***

Support both additional market-based exclusive allocations, and additional license-exempt.

Broadband: Available & Affordable

Facilities-based competition in deployment; reward last-mile investments

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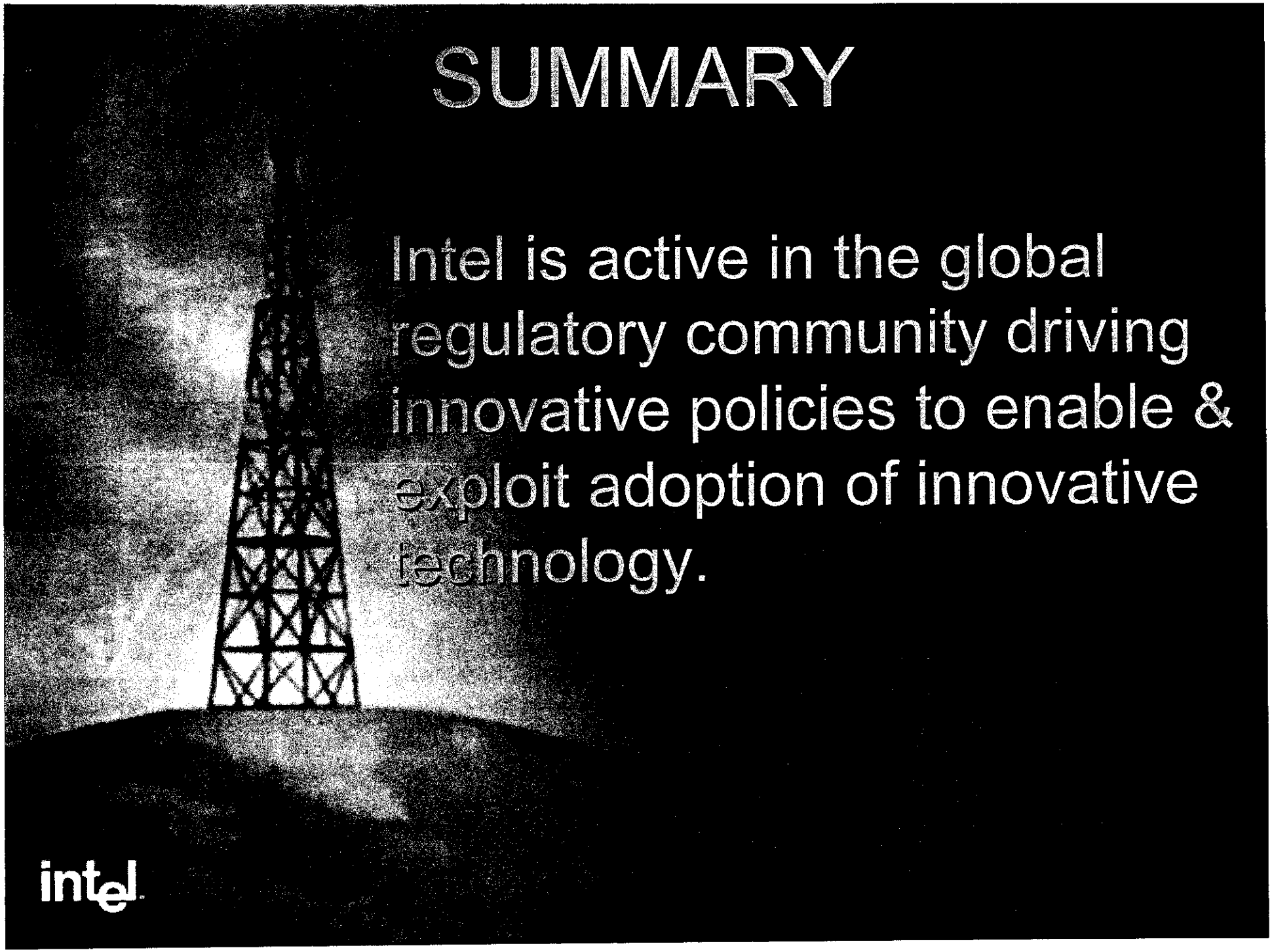
SUMMARY
Intel is active in the global regulatory community driving innovative policies to enable & exploit adoption of innovative technology.
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ADDITIONAL POLICY DETAILS

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Agile radio policy

US Proceedings- Intel Positions

- **FCC U-NII Devices in 5Ghz (FCC 03-110)**
  - Intel strongly supportive
  - Only the central controller is required to have DFS capability
  - No mandated TPC triggers or DFS implementations
  - Compliance date for rules tied to test procedure availability

- **Unlicensed Devices in TV bands (FCC 02-380)**
  - Many vacant channels exist even in crowded metros
  - Non-interference operation is absolutely possible.

- Multi-Part 15 NPRM **(FCC 03-223)**
  - Intel supports module approval
  - Intel against etiquettes, would inhibit innovation.

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Agile radio policy

International Proceedings- Intel Positions

- **EC TCAM Sub Working Group on SDR & R&TTE Directive**
  - Examining impact of SDR on R&TTE Directive for conformity.
  - Main issue is who is responsible for software changes
    - Intel believes the R&TTE directive does not pose a barrier to SDR deployment; and
    - Questions arising from responsibility for software software changes can be addressed by industry standards initiatives.
    -
- **ITU-R Report/Recommendation on SDR**
  - Intel Drafted US Submission
    - Promote innovative spectrum management
      - Access to new spectrum
      - "Impedance" matching spectrum to service.
    - Global circulation
      - Allow frequency agile devices to migrate
      - Coordinate certification regimes
    - Encourage standards activity
      - Justifies forbearance by regulators

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Underlay (UWB) Technology

International Proceedings

- ITU-R Task Group 1/8
  - Spectrum Management Framework Recommendation *(used as guidance to administrations when considering the introduction of UWB devices)*
  - "Compatibility" Study
    - UWB Characteri
    - Measuremen
- ITU-R Working Pa
  - "Compatibility" Studi
    - IMT-2000
    - RLANs
    - Satelli
- CEPT
  - SE24
    - Comp
- ETSI
  - TG31a
    - UWB System Reference Document
  - UWB STF

Intel often only UWB proponent on "earth"

More active defense of "FCC Mask" by FCC attendees at meetings would be appreciated

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Underlay (UWB) Policy
International Proceedings

- Fundamental Problems
  - Asymmetrical competition (one service against many); by operating over a wide swath of spectrum, UWB collects a wide swath of opponents.
  - UWB has no status in ITU (no allocation, operates on "non-conforming exception)
  - ALL CURRENT ACTIVITY UNDERTAKEN FROM A HOSTILE, PROTECTIONIST CONTEXT
- Doctrinal Issues
  - What is "Acceptable Interference"?
    - "Why should I (incumbent) accept any?"
      - 1 db rise in noise floor
        - US- NO, cites Public Safety
        - EC- Maybe
  - Un-intentional vs. Intentional
    - Analogous to non-profit entities being exempt from taxes.
    - Big distinction for ITU
    - Used by opponents.
  - Exclusivity
    - What rights of exclusion do licensed operators have?

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Broadband innovation

Evolution of Broadband Wireless

Point to Multi-Point, Last Mile Wireless Equipment Timeline

'90's '01	'02 '03	'04 '05
Off-the-Shelf 802.11 for License Exempt; Proprietary for Licensed	**Proprietary 70+ OEMs**	**Standard-based 802.16 Solutions & Proprietary**
Spectrum: • **License exempt 2.4 GHz** • **Licensed MMDS 2.5 GHz (AT&T Project Angel, Sprint BB Direct)** • **Licensed LMDS (26, 28, 39 GHz; Winstar, Teligent, ART)** • **Data rate:** 2-11 Mbps peak • **Chip sets:** use 802.11 or DOCSIS PHY or proprietary	• **Spectrum:** • **License exempt 2.4 & 5.x GHz** • **Licensed 2.5, 3.5 GHz, etc.** • **Data rate:** 6-54 Mbps peak • **Chip sets:** OEMs develop their own Silicon - some use 802.11x PHY with custom MAC • **Air interface:** • **OFDM & CDMA approaches** • **Proprietary mesh network and antenna techniques (beamforming, MIMO)**	• **Spectrum:** < 11 GHz • **Data rate:** Up to 75 Mbps peak • **Chip sets:** Volume silicon supplier • **Air interface:** 256 OFDM • **Standards:** Interoperable, carrier-class, economies of scale, rapid innovation, lower costs

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Broadband innovation

802.16; Designed from ground up for outdoor MAN

- Higher throughput at longer ranges (up to 50 km)
  - Better bits/second/Hz at longer ranges
- Scalable system capacity
  - Easy addition of channels maximizes cell capacity
  - Flexible channel bandwidths accommodate allocations for *both* licensed and license exempt spectrum
- Coverage
  - Standards-based mesh and smart antenna support
  - Adaptive modulation enables tradeoff of bandwidth for range
- Quality of Service
  - Grant/Request MAC supports voice and video
  - Differentiated service levels: E1/T1 for business; best effort for residential
- Cost & Investment Risk
  - Interoperable equipment lets operators purchase equipment from more than one vendor – WiMAX-Certified*
  - Standards-based platform improves OpEx by sparking innovation across the ecosystem: radio, NW mgmt, antennas, services

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Broadband Policy

MMDS/ITFS NPRM

- 2.500-2.690 GHz
  - Underutilized
  - > Cellular & PCS
  - Interleaved band plan
    - 1-way video
    - 2-way data precluded
  - ITFS site licensing
- Reform
  - Coalition plan
    - Deinterleaving
    - Market by market transition
  - Improvements
    - Facilitate aggregation
    - Eligibility
    - Certainty

Prime Spectrum Candidate

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